

## Increasing Agricultural Productivity in the Arabica Coffee Replanting Programme through a Gender Responsive Approach in Toraja District

Hariadi<sup>1</sup>, Novaty Eny Dunga<sup>1,\*</sup> and Mardiana Etrawaty Fachry<sup>2</sup>

<sup>1</sup>Gender and Development Studies Program, Postgraduate School, Hasanuddin University, Indonesia; <sup>2</sup>Department of Agribusiness and Fisheries, Faculty of Marine and Fishery Sciences, Hasanuddin University, Indonesia

\*Corresponding author's e-mail: [hariaditoraja@gmail.com](mailto:hariaditoraja@gmail.com)

Tana Toraja, Indonesia, is renowned for its "Toraja coffee," a highly sought-after specialty coffee. To meet the growing global demand, Toraja coffee production needs to increase. However, traditional gender roles often limit participation in coffee farm management. This research explores how integrating the roles of both men and women farmers can improve coffee production and farm management in Tana Toraja. A qualitative method with a phenomenological approach. Primary data sources are male and female farmers, and secondary data is supporting data from relevant agencies in Tana Toraja Regency, Indonesia. Data analysis techniques are used in the form of collection (observation, interviews, questionnaire filling), reduction (summarizing data), data presentation, and data verification (temporary conclusions). In the management of Arabica coffee, male farmers are involved 37.14 percent (less involved), female farmers 40.48 percent (less involved), the involvement of male and female farmers together, and alternately 77.62 percent (fully involved). The coffee rejuvenation program received a response of 45.00 percent (quite responsive) from male farmers; female farmers responded 46.66 (quite responsive), and the reaction of male and female farmers together and alternately was 91.67 percent (fully responsive). This research found that a gender-responsive approach, where both men and women farmers are fully involved in coffee farm management and rejuvenation programs, can significantly increase productivity and sustainability in Tana Toraja's smallholder coffee plantations. By integrating the roles of both genders, the research suggests that coffee farms can benefit from a wider range of skills, knowledge, and perspectives, ultimately leading to a more successful and sustainable coffee industry in Tana Toraja.

**Keywords:** Coffee, management, maintenance, rejuvenation, gender, agricultural sustainability, productivity.

### INTRODUCTION

Domestic and global demand for agricultural commodities continues to increase while production is sometimes insufficient, hence the need to increase raw material production. The upstream part of agriculture in the cultivation field should increase productivity by applying specific technologies and growing human resources' capacity to manage sustainable agriculture (Ahmad *et al.*, 2021).

Indonesia's coffee exports in 2021 reached USD 852 million, with the main export destinations being the United States, Egypt, Japan, Spain, and Malaysia. The contribution of the export composition for these five countries reached 60 percent of Indonesia's total coffee exports (Anonymous, 2021). Nevertheless, Indonesia's coffee trade development in the world market is still very dynamic. Brazil, Vietnam, Colombia, and Indonesia are the four countries that make up the world's largest coffee producers (Anonymous, 2023). Five

provinces that are the center of Indonesian coffee production are South Sumatra, Lampung, Aceh, North Sumatra, and Bengkulu. The coffee production for these five provinces in 2021 reached 69 percent of the total national production, while the remaining 31 percent was spread over 28 other provinces in Indonesia. South Sulawesi ranks seventh as a coffee producer in Indonesia at 36,014 tons annually (Anonymous, 2021). Especially for the Tana Toraja region, with an area of 10,772 hectares of arabica coffee plantations with a total production of 3,567.82 tons of market coffee (Anonymous, 2023) and is known as specialty coffee with a cupping score of 86.29 and was nicknamed Queen of Coffee at the 2<sup>nd</sup> Indonesia specialty coffee auction 2012 in Surabaya (Zulkarnain *et al.*, 2020).

Global demand for coffee is soaring, but coffee production is struggling to keep up. This is especially true in Indonesia, a

Hariadi, N.E. Dunga and M.E. Fachry. 2024. Increasing Agricultural Productivity in the Arabica Coffee Replanting Programme through a Gender Responsive Approach in Toraja District. *Journal of Sustainable and Economic Development* 12:1071-1081.

[Received 6 Jul 2024; Accepted 28 Aug 2024; Published 17 Nov 2024]



[Attribution 4.0 International \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/)

major coffee producer, where regions like Tana Toraja face unique challenges.

Tana Toraja has famous Arabica coffee, but production is declining due to aging plants, outdated varieties, and limited knowledge among farmers. Traditional gender roles may also hinder productivity, as women often play an important role in coffee farming but do not have full participation in management decisions (Bustanul *et al.*, 2023).

This research explores a promising solution: integrating gender roles in coffee farm management and rejuvenation programs. By utilizing the skills and knowledge of both male and female farmers, Tana Toraja can unlock the full potential of coffee growing and meet the growing global demand for high-quality coffee beans (Dita, 2019).

The challenge in the field faced by the tendency of low productivity is that the coffee plants available to farmers are old (approximately 20 years), and the coffee varieties are less adapted to global climate change, so they are no longer productive. Productivity problems upstream are inseparable from land fertility factors; the productivity of plant materials is still traditional, and productivity is increasing through intensive technology counseling (Lineton, 1975). Farmers are less focused on managing coffee plants. The reality in the field of coffee farmers in Tana Toraja district, Indonesia, one of which is in the Arabica coffee and horticulture centers in the Gandangbatu Sillanan sub-district, is an intercropping model, meaning that farmers develop two to three agricultural commodities that support each other in fulfilling life needs. An integrated farming system is an important strategy to address climate change issues in coffee plantations. This condition relates to limited knowledge and technical capacity, which means a technology transfer strategy is needed in CSA (climate-smart agriculture) (Wahidin, 2023). Presidential Instruction No. 9 of 2000, which mandates gender mainstreaming in agricultural development, is a strategy to realize gender equality and justice in development, where gender aspects must be integrated into the formulation of program policies and activities from planning to evaluation. Extension programs and financial funding can assist women farmers in supporting the sustainability of coffee farming (Octaviyani, 2024).

Productivity is the ability to produce in a given area (hectare) or per tree unit. Productivity refers to the ability. Increasing coffee productivity can be done through plant and branch rejuvenation (pruning). Coffee rejuvenation technology to increase productivity by not segregating the role of men and women farmers as managers but integrating male and female farmers (gender roles) needs to be immediately created and applied in the field so that a culture is formed that gender roles become a new agricultural cultivation technology (Muhammad, 2023).

In the issue of 'The Millennium Development Goals' (MDGs) in 2000, increased economic growth to reduce poverty must be able to encourage increased gender equality. In this study,

the full involvement of farmers (gender) in gender-responsive coffee management and coffee rejuvenation is given to the fulfillment of technological information needs (practical needs) as well as strategic needs for economic and welfare improvement, not based on assumptions of gender capabilities (stereotypes and subordination) (Anonymous, 2021).

## MATERIALS AND METHODS

This research uses a qualitative method with a phenomenological approach. Phenomenology focuses on understanding individual life experiences about a phenomenon. In this case, the phenomenon in question is the integration of gender roles in the management of Tana Toraja coffee farms. By talking directly with farmers, this research aims to capture this approach's perspectives, challenges, and potential benefits. Phenomenology is more than just describing experiences. It seeks to uncover individuals' deeper meanings and interpretations of those experiences. This allowed the research to explore how integrating gender roles shapes farmers' overall understanding and approach to coffee production. This approach aimed to capture the essence of the lived experience and the common core aspects among the participants. This helped identify critical themes and shared perspectives of male and female farmers on gender integration in coffee farming.

Data Collection Process:

1. Participants: The primary data sources were male and female coffee farmers in Tana Toraja.
2. Observations: The research will likely involve observing coffee farming practices, including how male and female farmers interact and contribute to different tasks. This may include observing daily routines, decision-making processes, and division of labor.
3. Interviews: In-depth interviews are conducted with both male and female farmers. These interviews will explore their personal experiences, perspectives on gender roles, and their expectations or concerns about integrating roles in coffee farm management. The interviews will explore how this approach impacts their work, decision-making, and overall coffee production.

## RESULTS

**Farmer involvement in coffee management (Cultivation, Harvest, and Post-Harvest):** From the results of interviews and filling out questionnaires of male farmers, female farmers, and joint and alternating involvement of male and female farmers in the management of arabica coffee in Gandangbatu Sillanan District, Tana Toraja Regency Indonesia, as follows.

Seeding and nurseries are the initial activities of coffee cultivation, consisting of seed procurement work, namely taking



selected coffee fruit as seed candidates from the parent tree and processing coffee fruit into seed candidate seeds. Furthermore, the provision of media, seed sowing, and the subsequent transfer of prospective seedlings to the nursery media until the seedlings are ready for planting in the field.

In seeding and nursery activities, male farmers are involved 20.00 percent (less involved), while female farmers in general in this activity (seed procurement work, seed sowing, and nursery) are involved 50.00 percent (moderately involved), more dominant than male farmers. This activity requires diligence and accuracy, especially in seed sowing, which is done manually; the role of female farmers in the field is more needed. Implementing activities in the field does not explicitly separate the work for male and female farmers but can be done together and alternately. The involvement of male and female farmers together alternately reached 70.00 percent (fully involved). Male and female farmers who were not involved in seeding and nursery activities were 30.00 percent. The planting preparation activities include land clearing, spacing, planting, and filling holes, essential fertilization, and

coffee shade planting. The involvement of male and female farmers, as well as the participation of male and female farmers together and alternately, is contained in this table.

In preparation for planting, some activities in the field are still predominantly done by male farmers, 43,33 percent (moderately involved) by the habits of the community that has been formed so far because this work is considered quite heavy and requires more energy. Hence, the involvement of women farmers reached less than 20,00 percent (less involved), where women farmers provide support through the domestic role of the family, serving the needs of their husbands by giving food and drink while working in the field. Male and female farmers are involved together, alternately 63,66 percent (moderately involved), and male and female farmers who are not engaged in this activity are 36,67 percent. Furthermore, in the Plant of the Year activity, namely planting and making terraces, the involvement of male farmers, female farmers, and the participation of male and female farmers together and alternately is presented in this table.

**Table 1.1. Seeding and nursery activities.**

No.	Activities	Farmer Engagement (M) Male; (F) Female M = 15 people; F = 15 people	Involvement of male and female farmers (30 people)	Male and Female Farmers Not Involved
<b>I.</b>	<b>Seeding and Nursery</b>	<b>M = 6 (20.00 %) / LI F = 15 (50.00%) / ME</b>	<b>21 (70,00 %)(FI)</b>	<b>M = 9 (30,00 %) F = 0 (0,00 %)</b>
1.	Seed procurementSeed sowing Nursery	M = 8 (26.67%) / LI F = 15 (50.00%)/ME	23 (76,67 %)(FI) 17 (56,67 %)(ME)	M = 7 (23,33 %) F = 0 (0,00 %)
2.		M = 2 (6.67 %) / LI F = 15 (50.00%) / ME	23 (70,00 %)(ME)	M = 12 (40,00 %) F = 0 (0,00 %)
3.		M = 8 (26.67%) / LI F = 15 (50.00%) / ME		M = 7 (23,33 %) F = 0 (0,00 %)

Description: Less Involved / LI = (10% - 40%) Moderately Engaged / ME = (41% - 70%) Fully Involved / FI = (71% - 100%)

**Table 1.2. Coffee management activities in the upcoming crop year.**

No.	Activities	Farmer Engagement (M) Male; (F) Female M = 15 people; F = 15 people	Involvement of male and female farmers (30 people)	Male and Female Farmers Not Involved
<b>II.</b>	<b>Crops of the Year to Come</b>	<b>M = 13 (43.33%) / ME F = 6 (20.00%) / LI</b>	<b>19 (63,33 %) (ME)</b>	<b>M = 2 (6,67 %) F = 9 (30,00 %)</b>
1.	Land clearingPlant spacing Making planting holes	M = 12 (40.00%)/LI F = 6 (20.00%) / LI	18 (60,00 %) (ME) 15 (50,00 %)	M = 3 (10,00 %) F = 9 (30,00 %)
2.	Backfill the hole andfertilize the	M = 12 (40.00%) / LI	(ME) 18 (60,00 %)	M = 3 (10,00 %)
3.	base. Plant coffee shade	F = 3 (10.00%) / LI M = 15 (50.00%) / ME	(ME) 23 (76,67 %) (FI) 22 (73,33 %)	F = 12 (40,00 %) M = 0 (0,00 %)
4.		F = 3 (10.00%) / LI M = 13 (43.33%) / ME	(FI)	F = 12 (40,00 %) M = 2 (6,67 %)
5.		F = 10 (33.33%) LI M = 12 (40.00%) / LI		F = 5 (16,66 %) M = 3 (10,00 %)
		F = 10 (33.33%) / LI		F = 5 (16,66 %)

Description: Less Involved / LI = (10% - 40%) Moderately Engaged / ME = (41% - 70%) Fully Involved / FI = (71% - 100%)



**Table 1.3. Coffee management activities at the Plant of the Year activity (crop of the year).**

No.	Activities	Farmer Engagement (M) Male; (F) Female M = 15 people; F = 15 people	Involvement of male and female farmers (30 people)	Male and Female Farmers Not Involved
<b>III.</b>	<b>Crop of the Year</b>	<b>M = 15 (50.00%) / ME</b> <b>F = 12 (40.00%) LI</b>	<b>27 (90,00 %)</b> <b>(FI)</b>	<b>M = 0 (0,00 %)</b> <b>F = 3 (10,00 %)</b>
1.	Planting	M = 15 (50%) / ME F = 15 (50%) / ME	30 (100,00 %)(FI) 24 (80,00 %)	M = 0 (0,00 %) F = 0 (0,00 %)
2.	Terrace construction	M = 15 (50%) / ME F = 9 (30%) / LI	(FI)	M = 0 (0,00 %) F = 6 (20,00 %)

Description: Less Involved / LI = (10% - 40%); Moderately Engaged / ME = (41% - 70%); Fully Involved / FI = (71% - 100%)

**Table 1.4. Coffee management activities on the maintenance of 1, 2, 3 years old non-yielding plants.**

No.	Activities	Farmer Engagement (M) Male; (F) Female M = 15 people; F = 15 people	Involvement of male and female farmers (30 people)	Male and Female Farmers Not Involved
<b>IV.</b>	<b>Maintenance of Immature Plants (1,2,3 years old)</b>	<b>M = 13 (43.33%) / ME</b> <b>F = 13 (43.33%) / ME</b>	<b>26 (86,67 %)</b> <b>(FI)</b>	<b>M = 2 (6,67 %)</b> <b>F = 2 (6,67 %)</b>
1.	Weed control	M = 15 (50.00%) / ME F = 10 (33.33%) / LI	25 (83,33 %) (FI)	M = 0 (0,00 %) F = 5 (16,67 %)
2.	Fertilization Shape trimming	M = 15 (50.00%) / ME F = 15 (50.00%) / ME	30 (100,00 %)(FI) 25 (83,33 %)	M = 0 (0,00 %) F = 0 (0,00 %)
3.		M = 10 (33.33%) / LI F = 15 (50.00%) / ME	(FI)	M = 5 (16,67 %) F = 0 (0,00 %)

Description: Less Involved / LI = (10% - 40%) Moderately Engaged / ME = (41% - 70%) Fully Involved / FI = (71% - 100%)

In the Crop of the Year activities in planting and terrace work, male farmers were involved 50.00 percent (moderately involved). Male farmers are more dominant than female farmers. At the time, terrace-making work in the community was considered men's work because it required quite a lot of energy, and women farmers were directed to light work in preparation for terrace-making (cleaning the land). Female farmers were involved 40.00 percent (moderately involved). For coffee planting, the joint involvement of male and female farmers is 100.00 percent (fully involved). Meanwhile, male and female farmers' participation alternately in the Crop of the Year activity reached 90.00 percent (fully involved). Male and female farmers who were not involved were 10.00 percent.

The process of coffee plants after planting is further maintenance on coffee plants aged one, two, and three years, and coffee has not been produced optimally, so it is categorized as Tanaman Belum Menghasilkan (TBM). In coffee maintenance activities on one, two, and three-year-old TBMs, the involvement of male farmers is 43.33 percent (moderately involved), and female farmers are 43.33 percent (moderately Involved) and the joint and alternating involvement of male and female farmers is 86.67 percent (fully involved). Maintenance work has become a habit in the community to be carried out together and alternately between male and female farmers as a family responsibility. Coffee plants at the age of one, two, or three years, if maintained

adequately following GAP (good agriculture practice) along with the progress of new superior varieties, have now begun to learn to bear fruit so that this also gives attraction and enthusiasm to farmers to be more intense in the field in the hope of getting higher production. Especially for fertilization, in the form of preparing the fertilizer furrow, burying the fertilizer, and closing the fertilizer furrow, the involvement reached 100.00 percent (fully involved). Male and female farmers who were not involved accounted for 13.34 percent of the total.

In coffee cultivation literature, when coffee plants are four years old, coffee can bear optimal fruit and is categorized as Producing Plants. Maintenance activities for Producing Plants include weed control with a rotation four times a year, not using herbicides but carried out manually (using a sickle) or with a mower. The results of weed removal are directed toward mulch and organic material in the rock holes of plants and towards environmentally friendly agriculture. Fertilization uses local organic fertilizer from integration with goats owned by farmers and subsidized NPK fertilizer to increase coffee bean weight. Shade management (gamal, lamtoro) is done periodically. Production pruning is usually carried out after harvest, while maintenance pruning (fine will) is carried out during the plant's rapid vegetative growth phase in February and March. Male farmers are 43.33 percent (moderately involved) in plant maintenance activities, and female farmers are 36.67 percent (moderately involved). In



**Table 1.5. Coffee management activities include maintaining and producing plants aged four years.**

No.	Activities	Farmer Engagement (M) Male; (F) Female M = 15 people; F = 15 people	Involvement of male and female farmers (30 people)	Male and Female Farmers not Involved
<b>V.</b>	<b>Maintenance of Producing Plants (4 years old)</b>	<b>M = 13 (43.33%) / ME</b> <b>F = 11 (36.67%) / LI</b>	<b>24 (80,00 %) (FI)</b>	<b>M= 7 (23,33 %)</b> <b>F = 9 (30,00 %)</b>
1.	Weed controlFertilization	M = 15 (50.00%) / ME	5 (16,67 %)	M = 0 (0,00 %)
	Shading arrangement	F = 10 (33.33%) / ME	(LI)	F = 5 (16,67%)
2.		M = 15 (50.00%) / ME	30 (100,00 %) (FI)	M = 0 (0,00 %)
	Production cuts	F = 15 (50.00%) / ME	12 (40,00 %)	F = 0 (0,00 %)
3.		M = 15 (50.00%) / ME	(LI)	M = 0 (0,00 %)
		F = 3 (10.00%) / LI	7 (23,33 %)	F = 17 (56,67 %)
4.		M = 8 (26.67%) / LI	(LI)	M = 12 (40,00 %)
		F = 15 (50.00%) ME		F = 0 (0,00 %)

Description: Less Involved / LI = (10% - 40%) Moderately Engaged / ME = (41% - 70%) Fully Involved / FI = (71% - 100%)

**Table 1.6. Coffee management activities in Product Collection.**

No.	Activities	Farmer Engagement (M) Male; (F) Female M = 15 people; F = 15 people	Involvement of male and female farmers(30 people)	Male and Female FarmersNot Involved
<b>VI.</b>	<b>Yield Collection</b>	<b>M = 10 (33.33%) / LI</b> <b>F = 13 (43.33%) / LI</b>	<b>23 (76,67 %) (FI)</b>	<b>M = 5 (16,67 %)</b> <b>F = 2 (6,67 %)</b>
1.	Coffee Harvest	M = 8 (26.67%) / LI	23 (76,67 %)	M = 7 (23,33 %)
		F = 15 (50.00%) / ME	(FI) 23 (76,67 %)	F = 0 (0,00 %)
2.	Transportationof results	M = 12 (36.67%) / LI	(FI)	M = 3 (10,00 %)
		F = 11 (33.33%) / LI		F = 4 (13,33 %)

Description: Less Involved / LI = (10% - 40%) Moderately Engaged / ME = (41% - 70%) Fully Involved / FI = (71% - 100%)

the work of coffee shade management, male farmers (50.00 percent/moderately involved) are more dominant than female farmers (10.00 percent/moderately involved) because this work consists of climbing the shade using a bamboo ladder, which is socially done by male farmers (appropriateness) but does not rule out the possibility of being done by female farmers if it is not too risky due to land factors and the safety of tools (bamboo ladder for climbing). Shade management is also combined with goat fodder collection activities owned by coffee farmers. Especially in pruning work that requires diligence and skill, female farmers are more dominantly involved (50.00 percent/entirely involved), and joint and alternating involvement of male and female farmers 80.00 percent (fully involved) means that activities in the maintenance of productive plants male and female farmers can take turns and together according to the potential ability to complement and support each other. Male and female farmers are not involved, 23.33 percent.

Harvesting in coffee plants consists of harvesting and transporting the harvest. In harvesting coffee crops, 33.33 percent of male farmers (moderately involved) are involved, and female farmers are concerned.

43.33 percent (moderately involved). Harvesting is the work that farmers are waiting for to get optimal production. Harvesting coffee fruit with GAP (good agriculture practice)

standards, namely optimally ripe coffee fruit (fresh red color at least 90 percent) not mixed with green and yellow fruit and fruit attacked by pests and diseases. Female farmers are involved 50.00 percent (moderately involved), doing more of this work because it requires diligence and consistency of picking quality that will affect the taste and selling price, but in the work of transporting products from the garden with varied topographical conditions and distance from the residence which is quite far, male farmers are involved 36.67 percent (moderately involved). Transportation of harvested crops using motorcycles or manual transport. The involvement of male and female farmers simultaneously and alternately in harvesting activities amounted to 76.67 percent (fully involved). Male and female farmers who were not involved reached 23.33 percent.

Post-harvest harvesting is a follow-up activity after harvesting. After the harvest is at the processing site, the coffee fruit will be pulped (stripping and separating the skin from the coffee beans using a pulper machine or traditional pulper). The following steps are fermentation (curing the coffee beans for eight to twenty-four hours), washing (washing the coffee beans until they are clean), and drying (drying under the sun on drying pans). After the beans (coffee grain/horn husk) reach the shelf-standard moisture content, the hulling process is carried out (stripping the horn skin into



**Table 1.7. Post-harvest coffee management activities.**

No.	Activities	Farmer Engagement (M) Male; (F) Female M = 15 people; F = 15 people	Involvement of male and female farmers (30 people)	Male and Female Farmers Not Involved
I.	Post-harvest	M = 8 (26.67%) / LI F = 15 (50.00%) / ME	23 (76,67 %) (FI)	M = 7 (23,33 %) F = 0 (0,00 %)
1.	Pulping Fermentation Washing	M = 15 (50.00%) / ME	30 (100,00 %) (FI)	M = 0 (0,00 %) F = 0 (0,00 %)
	Drying Hulling	F = 15 (50.00%) / ME	(FI)	F = 0 (0,00 %)
2.	Sorting coffee beans Roasting	M = 15 (50.00%) / ME	30 (100,00 %) (FI)	M = 0 (0,00 %) F = 0 (0,00 %)
	Grinding Resting Packaging Sales	F = 15 (50.00%) / ME	(FI)	F = 0 (0,00 %)
3.		M = 15 (50.00%) / ME	30 (100,00 %) (FI)	M = 0 (0,00 %) F = 0 (0,00 %)
		F = 15 (50.00%) / ME	(FI) 25 (83,33 %)	F = 0 (0,00 %)
4.		M = 10 (33.33%) / LI	(FI)	M = 5 (16,67 %)
		F = 15 (50.00%) / ME	30 (100,00 %) (ME)	F = 0 (0,00 %)
5.		M = 15 (50.00%) / ME	(ME) 18 (60,00 %)	M = 0 (0,00 %)
		F = 15 (50.00%) / MEM = 3	(ME) 18 (60,00 %)	F = 0 (0,00 %)
6.		(10.00 %) / LI F = 15 (50.00%) /	(ME) 18 (60,00 %)	M = 12 (40,00 %)
		MEM = 3 (10.00 %) / LI F = 15	(ME) 18 (60,00 %)	F = 0 (0,00 %)
7.		(50.00%) / MEM = 3 (10.00 %) /	(ME) 18 (60,00 %)	M = 12 (40,00 %)
		LI F = 15 (50.00%) / MEM = 3	(ME) 25 (83,33 %)	F = 0 (0,00 %)
8.		(10.00 %) / LI F = 15 (50.00%) /	(FI)	M = 12 (40,00 %)
		MEM = 3 (10.00 %) / LI F = 15		F = 0 (0,00 %)
9.		(50.00%) / ME		M = 12 (40,00 %)
		M = 5 (16.67%) / LI		F = 0 (0,00 %)
10.		F = 15 (50.00%) / ME		M = 12 (40,00 %)
				F = 0 (0,00 %)
11.				M = 10 (33,33 %)
				F = 0 (0,00 %)

Description: Less Involved / LI = (10% - 40%) Moderately Engaged / ME = (41% - 70%) Fully Involved / FI = (71% - 100%)

market coffee beans/green beans) and followed by sorting of coffee beans based on SNI (Indonesian National Standard) quality standards, the result of sorting is coffee beans ready for sale or ready for roasting. In downstream coffee, farmers and institutions can use roasting, grinding, resting, packaging, and selling to increase income. In post-harvest activities in general, the involvement of male farmers is 26.67 percent (moderately involved), while female farmers are 50.00 percent (moderately involved). Female farmers are more involved in all post-harvest processes because this process requires diligence, patience, accuracy, and consistency of quality. The harvest process results will determine the product's character (brand product) in the market. The involvement of male and female farmers together and alternately is 76.67 percent (fully involved). Male and female farmers who are not involved in post-harvest activities are 23.33 percent.

**Response of male, female, and gendered farmers in coffee replanting for productivity improvement in Tana Toraja district:** In this study, interviews and questionnaires were conducted to see whether the coffee rejuvenation

program with a single row spacing model and the use of new superior varieties (NSV) komasti was well received and attracted male farmers, female farmers, and male and female farmers together (gender roles). The implementation of coffee rejuvenation with single-row spacing (1.7 meters within rows and 3 meters between rows, population per hectare 1,960 trees) was initially conveyed to farmers who still could not imagine because so far, the plant spacing used was the square system (2 meters x 2.5 meters, population per hectare 2,000 trees). Through a demonstration plot of the use of a single row spacing system carried out by the Kopinta farmer corporation and Puslitkoka Jember in Kaluku hamlet, Salubarani village, Tana Toraja district in the March 2021 planting year (gender-friendly climate-smart coffee demonstration plot), it can be seen in the field so that farmers can observe directly. The planting distance in rows of 1.7 meters is intended for adaptation to declining soil fertility and climate change. In comparison, the distance between rows of three meters is intended to facilitate maintenance, labor mobility, and mechanization, as well as the potential for horticultural planting as intercrops before coffee production.



**Table 2.1. Farmer response (gender) to coffee rejuvenation with single row spacing and new improved varieties (VUB) komasti.**

No.	Program Rejuvenation	Farmer Response Male (15 people)	Farmer Response Female (15 people)	Farmer Response Male and Female (30 people)	Farmers do not respond. M = Male; F = Female
I	Planting distance of single fence system (1.7 m x 3 m) New Superior	14 (46,67 %) (MR)	15 (50,00 %) (MR)	29 (96,67 %) (FR)	M = 1 (3,33 %) F = 0 (0,00 %)
II	Varieties (NSV) of Komasti to be planted	13 (43,33 %) (MR)	13 (43,33 %) (MR)	26 (86,67 %) (FR)	M = 2 (6,67 %) F = 2 (6,67 %)

Description: Less Responsive / LR = (10% - 40%) Moderately Responsive / MR = (41% - 70%) Fully Responsive / FR = (71% - 100%)

The exciting thing about this single-row spacing system is that horticultural intercrops (potatoes, carrots, chilies, leeks, tomatoes) can be developed while waiting for coffee to be produced optimally. This is interesting for farmers in the highlands of Tana Toraja, in addition to being coffee farmers and horticultural farmers who have been developing separate lands that require time in management. The new superior variety used in the coffee expansion and rejuvenation program for the 2023-2024 fiscal year is Komasti (composite andungsari three) from Puslitkoka Jember. The choice of the Komasti variety results from a demonstration plot in the 2021 planting year and during climate change (high rainfall) in the 2021-2023 period. Regarding initial production, it is pretty stable (with a productivity of 600 kg/hectare). The posture of the komasti variety is kate with a two-stage pruning system. Stage one has a height of 120 centimeters, and stage two has a height of 150 centimeters (single trunk), with six primary branches as the main production branches. This facilitates maintenance, further pruning, and harvesting. From the socialization results as well as farmer group visits to the gender-friendly climate-smart coffee demonstration plot garden, responses from farmers are needed that coffee rejuvenation activities in Gandangbatu Sillanan sub-district can be carried out with new techniques with single row spacing and the use of new superior varieties (NSV) ko masti, presented in the following table.

The single-row spacing system received a response of 46.67 percent (moderately responsive) from male farmers, while female farmers responded 50.00 percent (moderately responsive).

This occurred because farmers thought only men or women would work on this activity (stereotype). However, after being given counseling and technology dissemination of demonstration plot results that the coffee rejuvenation program using single row spacing and new superior varieties (NSV), Komasti will involve male and female farmers together, and alternately, male and female farmers fully responded (96.67 percent).

The single-row spacing technique in the rejuvenation program will facilitate the mobility of maintenance (weed removal, fertilization) carried out by male farmers, female farmers, and

male and female farmers supporting each other. The single-row spacing system is not specifically for women farmers only (stereotypical) who are generally quite involved in coffee management from cultivation, harvesting, and post-harvesting in smallholder coffee plantations in the Tana Toraja district. Still, for male farmers, the single-row spacing system also provides convenience in transporting the harvest, arranging shade, and other activities in coffee management. Single-row spacing will support increased intercrop income through horticultural commodities (cabbage, potatoes, carrots, chilies, leeks, tomatoes) that can be harvested before coffee plants produce well. Maintenance of intercrops can be done alongside the main coffee crop. The maintenance of intercrops can be carried out by male and female farmers together alternately (gender). It does not increase the workload for female farmers but becomes an alternative source of increased income for the family.

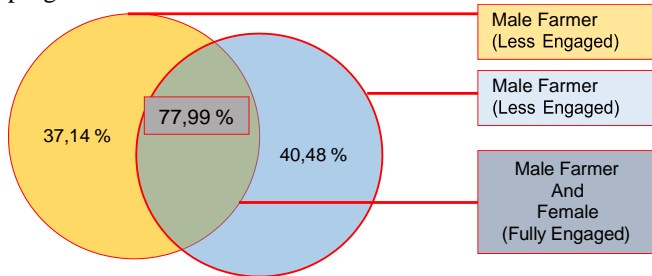
The new superior variety (VUB) Komasti received a response of 43.33 percent (quite responsive) from male farmers, while female farmers responded 43.33 (quite responsive). Farmers have seen firsthand the posture, productivity potential, and maintenance techniques, especially the two-stage pruning that will be applied to Komasti varieties in the agricultural extension demonstration plots that have been carried out since 2021. After being given an explanation and understanding through counseling and technology dissemination according to the results of the gender-friendly climate-smart coffee demonstration plot using the Komasti variety, the response of male and female farmers together was 73.33 percent (fully responsive). The new superior variety (NSV) that will be planted in coffee rejuvenation in Tana Toraja district in the 2023-2024 fiscal year is Komasti (composite andungsari three) with a kate-type tree posture and at the time of pruning the shape will use two stages and six main primary branches as production branches, the posture of the kate-type Komasti variety with a final height of 150 centimeters (single trunk) will provide convenience when harvesting. Farmers' ease in harvesting will lead to time efficiency so that yields will be optimized. Komasti varieties also received a complete response due to faster production and higher potential (started fruiting TBM 2 and TM 1 productivity is 600 kg/ha).





## DISCUSSION

**Farmer Involvement in Arabica Coffee Management in Tana Toraja:** Female farmers have a slightly higher level of involvement due to cultural norms and family roles. Farmer group activities vary, some based on skills and abilities, while women handle all aspects. The text emphasizes the importance of gender mainstreaming in agricultural programs.



**Figure 1. Involvement of male farmers, female farmers, male and female farmers together and alternately in arabica coffee management in smallholder plantations in Tana Toraja district, Indonesia.**

In managing arabica coffee in smallholder plantations in Tana Toraja district, Indonesia, male farmers account for 37.14 percent of the total (less involved). Female farmers are also involved at 40.48 percent (less involved). Female farmers' involvement exceeds that of male farmers. The respondents again confirmed this result: Why are female farmers more dominant than male farmers in their participation in coffee management, or is there an element of compulsion and an additional workload for female farmers?

Women farmers, as respondents, answered that this coffee management is one of the sources of family livelihood, and it is an obligation to help their husbands without seeing the separation and division of labor based on gender. Field activities carried out by female farmers (as wives) will be adjusted according to free time opportunities in addition to taking care of the house, children, and husband. Some work usually done by male farmers (husbands) is unable to be done by female farmers (wives) due to habits that have not been well developed or need special skills, or some risks may occur due to land and natural factors. Female farmers as wives will convey to their husbands to be assisted or taken over with their awareness as the head of the family. Field activities in coffee management, from cultivation, harvesting, and post-harvesting, are not a burden of additional work for women farmers as wives. Still, they are a form of support for increasing family income. Habits from childhood as children of coffee farmers in Tana Toraja Regency are also one of the factors in getting used to working in coffee farms that have been embedded since childhood.

In farmer group activities consisting of male farmers only,

farmer group activities that apply coffee management from cultivation, harvesting, and post-harvesting in groups in a rotating system (Lembongan farmer group in Toraja language), male farmers in cultivation activities such as seed sowing, nursery (filling polybags), harvesting and post-harvesting will work on these activities by Organizing a working system assisted by wives (female farmers) has been agreed upon in deliberations through farmer group meetings. During some other activities, male farmers carry out these activities directly using their skills (Baihaqi *et al.*, 2022; Nasir *et al.*, 2023).

In farmer groups consisting of male farmers only or farmer groups consisting of male farmers and female farmers, field activities in coffee management from cultivation, harvesting, and post-harvesting with alternating group work systems (Lembongan farmer groups in Toraja language), there are no written arrangements or special arrangements for male and female farmers to work on these activities in the field. Everything is done with full awareness of helping each other and adjusting the skills and abilities of male and female farmers to get optimal results. From the two examples of farmer group membership in the implementation of cultivation, harvest, and post-harvest activities, there is no discriminatory implementation of activities based on male and female gender. All will be done together in cooperation between male and female farmers (gender) without leaving the social-cultural order in the form of the appropriate type of activity that can be done generally by male and female farmers.

In the farmer women's group, whose members are all women farmers, coffee management activities from cultivation, harvesting, and post-harvesting will all be done by women farmers with skills and abilities in groups. The quality of work on cultivation activities (land clearing, making planting holes and arrangements), which male farmers usually dominate, will still be done by female farmers with their abilities. From the field experience, the women farmer groups are more intense in carrying out activities in groups in rotation and alternation (Lembongan group of women farmers in Toraja language).

In farmer economic institutions in the form of joint business groups (KUB) and Farmer Corporations, all activities have led to economic activities to increase income with male and female farmer members, in cultivation activities (nurseries and seedlings) or in post-harvest production (coffee beans) which leads to agribusiness sales, the involvement of members of farmer economic institutions will organize activities according to the agreed work system either in work groups or individually by the set targets. If farmer economic institution members are female farmers, they will be assisted by other family members (husband, children, and relatives), and vice versa. If farmer economic institution members are male farmers, they will be assisted by other family members (wife, children, and relatives). The division of labor and

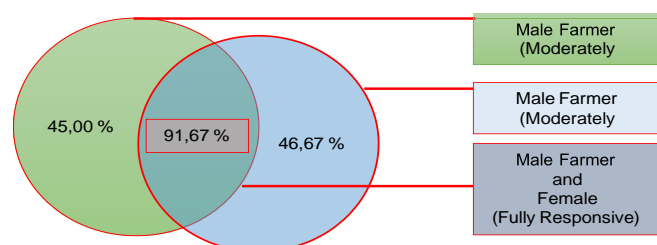




activities in implementing farmer economic institutions is not based on gender but on member empowerment, with provisions set based on the quantity and quality of ready-to-sell production through the farmer economic institutions partnership program and other parties (Anonymous, 2021). From cultivation, harvesting, and post-harvesting, coffee management involves male and female farmers together and alternately, at 77.99 percent (fully involved). The involvement of male farmers and female farmers is almost balanced. The roles of male and female farmers in coffee management are complementary (Ni and Indrayani, 2021). There is no discrimination in the division of labor activities based on gender (stereotypes). Both male and female farmers can do all. The paradigm of roles can be carried out alternately and together between men and women for a common goal; both at the family and institutional levels of farmers can no longer be disaggregated based on gender (stereotypes). The appropriateness of women farmers in carrying out gender roles certainly still exists within the social appropriateness of Toraja culture.

Gender mainstreaming in agricultural development is a strategy to realize gender equality and justice in development, where gender aspects must be integrated into the formulation of program policies and activities from planning to evaluation (Napitupulu and Ekawaty, 2022). This is the basis for the district, provincial, and central governments, which state that agricultural programs directed to the community through farmer institutions do not need to be specifically disaggregated based on workloads that lead to gender conformity. All agricultural programs should be directed to farmer institutions, farmer groups, farmer women groups, and farmer economic institutions based on production potential and human resource capabilities to increase productivity, production, and farmer income.

**Farmers' Response to Coffee Replanting Program:** In general, farmers' responses to coffee rejuvenation activities with the application of single row spacing using new superior varieties (VUB) ko masti are acceptable to coffee farmers in coffee rejuvenation locations in the Gandangbatu Sillanan sub-district, contained in the following table.



**Figure 2. Response of male farmers, female farmers, and male and female farmers to the coffee replanting program to increase arabica coffee productivity in Tana Toraja smallholder plantations, Indonesia.**

Rejuvenation of coffee plants is one way to increase productivity. Coffee rejuvenation can be done by replacing old plants with new, superior plants in combination with the application of planting distance and the development of intercrops. It also rejuvenates branches on coffee plants that are still good in growth but are not yet producing optimally with a pruning system.

A strategy needs to be formulated to implement the replanting program. In this study, the rejuvenation strategy of applying a single fence spacing system (within rows of 1.7 meters and between rows of 3 meters) using the new superior variety (NSV) komasti initially received a poor response from male and female farmers. Through thematic training activities by agricultural extension officers, explanation and understanding, as well as dissemination of technology demonstration plots, were conducted to male farmers and female farmers (farmer group members) as potential recipients of the 2024 coffee rejuvenation program in Tana Toraja Regency. The planting distance of a single row system in the space between rows (3 meters) and applying an intercropping system of coffee and horticulture (cabbage, potato, chili, onion, tomato) can increase farmers' income and income from coffee production. Intercropping in this intercropping is an alternative to fulfill practical needs as a source of income and increased farmer revenue. Intercropping system activities can be done together with male and female farmers. The existence of intercrops in the intercropping system of coffee and horticulture will increase the intensity of farmer visits to the coffee plantation so that the development of coffee plants as the main crop is monitored periodically. In maintenance (weed control), horticultural crops will affect coffee plants because horticultural management is more intense periodically, and farmers have a habit of working thoroughly on the land. At the time of fertilization, farmers need assistance from field agricultural extension workers with the fertilization schedule for coffee and horticultural crops, which may not coincide (Fitri and Prasmatiwi, 2022). The choice of horticultural species as intercrops in the intercropping system will be adjusted to the agreement of male and female farmers (farmer families), season predictions, and prices in the horticultural market (Sunanto et al., 2019). With this new system rejuvenation program, the response of male and female farmers together and alternately in the field implementation received a reaction of 91.67 percent (fully responsive).

Information technology should not be a gender constraint for male and female farmers due to limited access to information, finance, and time. Especially for women farmers, time constraints are prevalent because domestic and public roles are performed together. Interventions to overcome limitations must be implemented, especially by field agricultural extension workers as the frontline in assisting farmers. Practical action (practice decision) in the form of part-time training (adjusted to the free time of male and female farmers),



affordable distance, safe and unpaid with a partnership model (academics, farmer observer institutions, related research centers) in collaboration with central, provincial and local government programs (agriculture, cooperatives and trade industry, and village community empowerment) (Rusli *et al.*, 2023). Sustainable strategic action (sustainable practice) in the form of setting a minimum quota of female participants in leadership training and negotiating skills in product marketing partnerships for male and female farmers and encouraging increased awareness of gender for farmer assistants (field agricultural extension workers) and policymakers at the Regional, Provincial and Central Governments so that agricultural programs in farmer institutions are not disaggregated based on assumptions of gender (stereotypical) and physical abilities that lead to gender inequality (Sarvina, 2020). Therefore, the coffee rejuvenation program in the Tana Toraja district in 2024 is categorized as gender-responsive.

**Conclusion:** Some findings of the results of this study are as follows:

1. The management of smallholder coffee plantations in the Tana Toraja district fully involves male and female farmers together in turn (gender quality), and there is no specific division of labor based on gender-based assumptions of ability (stereotypes),
2. Coffee replanting with single row spacing and using new superior varieties (VUB) ko masti received a complete response from male and female farmers together (gender-responsive) to increase agricultural productivity to support increased income so that there is equality in the roles of men and women (gender mainstreaming) in improving the family economy.

**Authors' contributions statement:** Hariadi, N. E Dungga, M. E Fachry designed and completed the experiments; Hariadi, N. E Dungga, M. E Fachry prepared the draft; Hariadi, N. E Dungga, M. E Fachry reviewed and finalized the draft.

**Conflict of interest:** The authors declare no conflict of interest.

**Acknowledgment:** The authors are very grateful to Hasanuddin University.

**Funding:** No Funding

**Ethical statement:** This article contains no studies regarding humans or Animals.

**Availability of data and material:** We declare that the submitted manuscript is our work, which has not been published before and is not currently being considered for publication elsewhere.

**Informed consent:** Written informed consent was obtained from all participants regarding publishing their data.

**Consent to participate:** All authors participated in this research study.

**Consent for publication:** All authors submitted consent to publish this research. article in JGIAS.

## REFERENCES

- Ahmad, B., A. Nur, D. Anwar, Bagio and A. Rita. 2021. Alokasi Waktu Kerja Keluarga Petani Kopi di Dataran Tinggi Gayo. *Jurnal Ekonomi Manajemen dan Bisnis* 23:79-88.
- Anonymous. 2021. Badan Pusat Statistik Indonesia. Available online at <https://www.bps.go.id/>
- Anonymous. 2023. Badan Pusat Statistik Kabupaten Tana Toraja. Available online at <https://tatorkab.bps.go.id/>
- Zulkarnain, Z., R. Rahmaddiansyah and R. Alpian. 2020. Perbandingan Tingkat Produktifitas dan Pendapatan Petani Kopi Arabika Yang Melakukan Pemangkasan dan Rutin Dengan yang Tidak Rutin di Kecamatan Bener Kelipah. *Jurnal Agrisep* 21:38-50.
- Bustanul, N., D. Rukman, W.R. Mappatunru, R.A. Nadja, S. Saadah., 2023. Kontribusi Perempuan dalam Pertanian dalam Meningkatkan Pendapatan dan Pengelolaan Ekonomi Rumah Tangga di Desa Moncongloe Bulu Kecamatan Moncongloe Kabupaten Maros. *Journal of Agricultural and Rural Economy* 1:32-39.
- Dita G.N. 2019. Universitas Brawijaya Fakultas Pertanian, Malang. Available online at <https://repository.unej.ac.id/>
- Lineton, J. A. 1975. An Indonesian society and its universe: a study of the Bugis of South Sulawesi (Celebes) and their role within a wider social and economic system. University of London, School of Oriental and African Studies (United Kingdom).
- Wahidin, Nurwahyuningsih, E. 2023. Peran Ganda Perempuan Petani Kopi Semende di Desa Ulu Danau dalam Meningkatkan Kesejahteraan Keluarga. *Jurnal Ilmiah Ilmu Sosial* 9:173-180.
- Octaviani, M.L. and E. Endang. 2024. Analisis Disparitas Gender Terhadap Pertumbuhan Ekonomi Indonesia. *Ekonomis: Journal of Economics and Business* 8:535-544.
- Muhammad, S. F. 2023. Universitas Lampung. Bandar Lampung. Available online at <http://repository.radenintan.ac.id/>
- Baihaqi, A., T. Fauzi, E. Susanti, A.H. Hamid, E. Rasmikayati, R. Moulana, A.H. Marzani. 2022. Household spending decisions analysis of coffee farmers in Aceh Tengah District. In *IOP Conference Series: Earth and Environmental Science* 951:012085.
- Nasir, A., N. Nurjana, K. Shah, R.A. Sirodj and M.W. Afgani. 2023. Pendekatan Fenomenologi Dalam Penelitian



- Kualitatif. *Innovative: Journal Of Social Science Research* 3:4445-4451.
- Ni Luh S.Y. and L. Indrayani. 2021. Keterlibatan Perempuan dalam Sektor Pertanian Untuk Menunjang Kesejahteraan Keluarga Menurut Perspektif Feminisme (Studi Kasus Di Desa Songan, Bangli, Bali) *Jurnal Pendidikan Ekonomi* 9:261-269.
- Napitupulu, F. and M. Ekawaty. 2022. Ketimpangan Gender dan Pertumbuhan Ekonomi: Studi Kasus Pada Negara-Negara Asia Timur dan Pasifik. *Journal of Development Economic and Social Studies* 01:29-43.
- Fitri, R. A. and F.E. Prasmatiwi. 2022. Peran Gender, Pendapatan Dan Kesejahteraan Subjektif Rumah Tangga Petani Kopi Di Kecamatan Sumberejo Kabupaten Tanggamus. *Jurnal Ilmu-Ilmu Agribisnis: Journal of Agribusiness Science* 10:291-298.
- Sunanto, S., S. Salim and A.W. Rauf. 2019. Analisis kesepakatan peningkatan produktivitas kopi arabika pada pengembangan kawasan Di Kabupaten Toraja Utara. *Jurnal Sosial Ekonomi Pertanian* 15:42-55.
- Rusli, R., S. Syahidin, F. Ridhana, S. Salman and L.W. Sipahutar. 2023. INTEGRASI TERNAK SAPI BALI DENGAN TANAMAN KOPI ORGANIK UNTUK MENINGKATKAN PENDAPATAN PETANI KOPI PASCA-COVID-19. *Martabe: Jurnal Pengabdian Kepada Masyarakat* 6:280-287.
- Sarvina, Y., T. June, E. Surmaini, R. Nurmawati and S.S. Hadi. 2020. Strategi peningkatan produktivitas kopi serta adaptasi terhadap variabilitas dan perubahan iklim melalui kalender budidaya. *Jurnal Sumberdaya Lahan* 14:65-78.

